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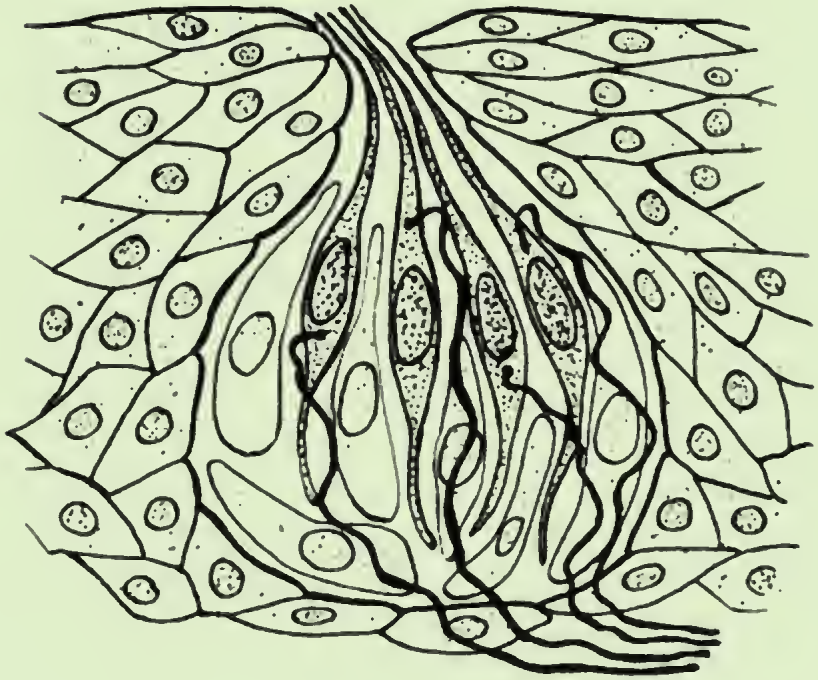

TASTE

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TASTE

Broiled eels in sauce or Limburger cheese may seem like delicacies to some, but may be avoided by others. Candy may appeal to many, but to others it may taste oversweet. And so with many other foods, what one person may consider tasty, another may shun.

Why do some foods appeal to one person but not to another?

Many factors contribute to a person's likes and dislikes in foods. The taste buds in the tongue, the sense of smell, the sense of touch, the temperature, flavor and texture of the food and cultural background, all play a part in producing the sensation commonly called taste.

What we may ordinarily call taste, may not be taste at all.

The fragrance of breakfast coffee percolating on the stove and the delicious aroma of frying bacon or broiling beefsteak add much to the enjoyment of their taste. If you held your nose as you ate them, you would find that the tantalizing aroma does more than add to the flavor—it is the flavor. What you thought you were tasting, you really were smelling.

Cold coffee, when hot coffee is expected, is unappetizing, although chemically the constituents are the same. The pleasant fragrance associated with the taste of hot coffee is missing.

Temperature also affects the taste of food and beverages. Did you ever let ice cream melt and then taste the syrupy liquid that resulted? If so, you may remember that it is much too sweet for enjoyment, although the frozen dessert is just right. Soup should be seasoned "to taste" at the temperature at which it will be eaten. Otherwise the cook is likely to find that she has put in too much or too little salt or spices.

Familiarity and cultural background influence taste. Snails, frog legs, roasted grasshoppers and bird's nest are enjoyed by those who are brought up in environments where such foods are served, while to others, they may have no appeal whatsoever.

What then is taste? And how do we distinguish the taste of one food from another?

You will find the answers to these questions as you do the experiments in this unit.

First identify the specimens in your

unit.

SWEET—Cube of cane sugar.

SALT—Sodium chloride in individual packet; the only substance that produces a pure salty taste.

SOUR—Citric acid crystals; to illustrate the typical sour taste of acids; fine crystals in polyethylene bag.

BITTER—Quinine sulfate diluted with lactose, milk sugar, to reduce the intensely bitter taste; white crystals in polyethylene bag.

SALT AND BITTER—Epsom salt, magnesium sulfate; produces a compound taste of salt and bitter; small clear crystals in polyethylene bag.

AROMATIC TASTE—Bubble gum; flavor due to smell as well as taste.

TASTE BLINDNESS PAPER—Paper impregnated with phenylthiocarbamide, PTC; tastes bitter to some and is tasteless to others; in polyethylene bag.

To identify the three packages containing the white crystals, citric acid, Epsom salt and quinine, taste a little of each and label them accordingly to your findings. You should have no difficulty in recognizing the different tastes. If you are uncertain about the bitter taste, Experiment 1 will be helpful.

PRIMARY TASTE

There are four basic or primary taste sensations: sweet, sour, bitter and salt. All other true tastes are a combination of these.

Experiment 1. You may believe you can identify all four of the primary tastes without any difficulty, but are you sure?

Some people are so unfamiliar with strong bitter tastes that they mistakenly call them sour. Taste a little of the quinine. Is it sour or bitter? Drink water to get rid of the taste and then taste a bit of the citric acid. If the quinine tasted sour to you, did it have a true sour taste as compared to the citric acid?

The magnesium sulfate will have a bitter as well as salty taste, distinguishing it from the quinine.

Experiment 2. Examine your tongue in a mirror. You will see that the surface is rough and covered with tiny bumps. These small projections are the papillae in which the taste buds, the sense organs of taste, are located. The papillae vary in size. Those at the back or posterior part of the tongue, called circumvallate papillae, are larger than the fungiform papillae at the front or anterior end.

The taste buds contain the taste recep-

tors, spindle-shaped cells with hairlike processes that converge toward the tiny opening or taste pore (see diagram on cover showing a cross-section of a taste bud with taste cells and nerve fibers).

Taste buds are found not only on the surface of the tongue, but also in the hard and soft palates, the pharynx and larynx, but to a lesser degree.

The sense of taste is a chemical sense, that is, the taste buds react to stimuli of a chemical nature.

In order for a substance to give a sensation of taste, it must be in solution and enter the taste pore of the taste bud and reach the receptors. The chemicals in solution stimulate the receptors which send messages to the brain where they are interpreted as taste. Exactly how this happens is still not known. Research seems to indicate that definite protein molecules are the initial receptors of taste. It has also been found that the presence of copper in the body is essential for taste sensation.

Although the tongue and palate acting together provide taste sensations when we eat, in general, certain regions of the tongue and palate have been found to be more sensitive to a particular taste than

to others. The tip of the tongue is most sensitive to salt and sweet, the sides to sour and the back of the tongue to bitter.

In the palate, the posterior area is most sensitive to sour and bitter and the anterior to salt and sweet.

The number of taste buds decreases with age and elderly persons have a less acute sense of taste than children.

The sugar, salt, citric acid and quinine supply the four basic tastes for our experiments.

Experiment 3. Quinine is extracted from the bark of the tropical cinchona tree. It is only one of many chemically unrelated substances that taste bitter. The specimen contained in this kit is in the form of quinine sulfate diluted with lactose so that it will not be too intensely bitter, and also so that someone swallowing the entire sample would not get too large a dose.

When you are eating your breakfast, think of the dishes that have a mild, bitter taste. The juice of grapefruit is sour, but the skin is bitter. Coffee without sugar is bitter. Burnt toast has a bitter flavor and so do some marmalades containing strips of orange or grapefruit rind.

Experiment 4. Taste some of your citric acid. Then taste some of the sour

substances that you may have around the kitchen, such as lemon, lime and vinegar. Is the sour taste in them stronger or weaker than in the citric acid? Are they truly sour, or are they a combination of tastes?

It is citric acid that gives the sour taste to lemons and other citrus fruits.

Experiment 5. Break off a piece of your sugar cube and suck on it to get rid of the sour and bitter tastes. You undoubtedly could spot the taste of sugar anywhere, but how would you describe it to someone unfamiliar with sweets? Since taste is a subjective sensation and each person knows only how a substance tastes to him, it is very difficult to describe a specific taste. Only by comparison with something with a similar taste can you really explain a taste to someone else.

Experiment 6. Take your packet of salt and examine the fine crystals. Place a few of them on your tongue and you will immediately obtain a salty taste. The salty taste comes from the sodium and chloride ions that are formed when the salt goes into solution with the moisture on your tongue. Both the sodium and chloride ions produce the salty taste.

Sodium chloride, common salt, is the only chemical that provides the true salt

taste. Other salts, such as sodium bicarbonate and magnesium sulfate have a salty taste mixed with sour or bitter.

Since sodium is necessary for the growth of animals, herbivorous animals, those that thrive on vegetation alone, will travel great distances when necessary to reach an area where sodium salts are found. Although other minerals, such as potassium, magnesium and ammonium give a salty taste, the animals will seek out only sodium salts.

Experiment 7. Dry your tongue well with a towel. Place a piece of dry cookie or other solid food on your tongue. Can you taste it?

Now chew on it. As soon as the cookie is moistened and some of it is dissolved, its taste becomes evident. Only when a substance is in solution can it arouse a taste sensation.

Experiment 8. Dampen one end of a toothpick or similar instrument slightly. Dip the end into the salt picking up a few crystals. Place the salt crystals on the tip of your tongue. Repeat on the sides and back of the tongue, using the same amount of salt each time and rinsing your mouth after each test. On what section of the tongue do you find the greatest sensation of saltiness?

For best results in the following experiments, rinse your mouth with water after each test and use a fresh toothpick for each substance.

Experiment 9. Repeat Experiment 8 with citric acid, sugar and quinine and find the location on your tongue where the sense of taste for each seems most pronounced.

You will find that the taste buds are distributed in clusters over the tongue and different areas are more sensitive to certain tastes than to others. The tip of the tongue reacts to all of the four basic tastes, but is more receptive to sweet and salt. The sides of the tongue react to sour and salt, but are more sensitive to sour, while the back of the tongue responds to bitter stimuli.

Make a diagram of your tongue and map the taste sensations on it. Note where they are most sensitive to the four basic tastes. Map the tongue of several of your friends. Are they all fairly similar?

Experiment 10. Place a few grains of salt in the center of your tongue. Can you taste it? Repeat with citric acid, sugar and quinine. What do you find?

The center of the tongue is not usually sensitive to any great extent to taste stimuli.

The taste buds for bitterness are the most sensitive of the taste receptors. Bitterness can be detected in concentraions many times less than those for sugar, salt and citric acid. Since bitterness is often associated with poison, this sensitivity may be nature's way of protecting man.

Experiment 11. Apply the four tastes to your palate. What do you find? Is the back of your palate more receptive to sour and bitter? Where do you taste sweet and salt?

How would full dentures that cover the whole palate affect a person's sense of taste? Which sensations would be most affected?

The taste sensations for salt and sweet predominate on the tongue and for sour and bitter on the palate. Do you find this to be true?

COMPOUND TASTES

Experiment 12. Taste a little of the magnesium sulfate. Can you taste both the salt and the bitter? Epsom salt is an example of a compound taste. On what part of the tongue does the bitterness become evident?

Dissolve a small amount of the sodium chloride together with a little quinine in water and see if the mixture tastes like

Epsom salt. Do you taste both salt and bitter?

Saccharin produces a sensation of sweetness although it has no relationship to sugar. It is used as a sugar substitute by some who cannot eat sugar. If you have some saccharin handy or can get a tablet from a friend, taste a little. You will discover that it is not just sweet, but sweet combined with bitter. This explains why saccharin must be used in moderation. If too large a quantity is put into your tea or coffee, the saccharin will give the drink a distinctly unpleasant taste.

Experiment 13. The taste of many of the foods you eat is a combination of not just two, but three and even all four of the primary tastes. Taste sweet pickles, soup, spaghetti sauce and other foods to see how many of the primary tastes you can identify.

Experiment 14. Taste the quinine again, then immediately taste a little sugar or salt to see if the quinine has affected or deadened your ability to taste. While some substances are so mild they have no effect on the foods tasted immediately afterwards, others are quite intense and may change slightly the taste of foods that follow. They may even keep a person from tasting some of them. Smoking tends to

deaden the taste.

Experiment 15. Some substances intensify the taste or flavor of other substances.

Salt not only has a taste of its own but brings out other tastes. You are all aware of the flat taste of unsalted foods. Taste a little unsalted soup or a vegetable. Now add some salt to another portion of the same food and taste it. Note how the flavor of the food is enhanced. A little salt sprinkled on sweet melon makes it taste much sweeter.

Taste a little of your salt and wait a few seconds until the salty taste has almost disappeared. Then taste a little sugar and notice how much sweeter it tastes.

Conversely, the saltiness of food is enhanced by a sweet substance. Place a very dilute solution of salt on one side of the tongue. On the other side place a small amount of sugar. Notice how the taste of salt is brought out as soon as the sweet sensation is produced.

Monosodium glutamate, a chemical taste enhancer, has little positive taste of its own, but it is used widely in cooking to intensify the flavor already present. If you have some available, add a trace to your soup or gravy and notice how this chemical brings out the flavor.

SENSE OF SMELL AND TOUCH AFFECT TASTE

Experiment 16. Take the piece of Dubble Bubble gum in your unit and while holding your nose and breathing through your mouth, put the gum in your mouth and chew it. Note its taste. Now let go of your nose so you can smell the fragrance of the gum and notice how much better it tastes.

The sense of smell is intricately related to the sense of taste. Without your sense of smell, or olfactory sense, the food you eat would lose much of its flavor for you and some foods would have no flavor at all.

Experiment 17. Prepare a little sweetened hot coffee and hot chocolate. Then blindfold yourself and ask a friend to give you one of them to drink while you hold your nose (a snap clothespin will be helpful). Can you identify the drink without breathing through your nose?

Broil a small piece of ham and a similar piece of beef or lamb. Then again blindfold yourself and hold your nose. Can you identify the meat when your friend places a piece of one of them in your mouth?

Now blindfold your friend and ask him to hold his nose while you feed him a

slice of raw potato and then a piece of apple of the same size. Can he tell which is which?

Repeat the experiment with other foods and with food flavorings, such as vanilla and peppermint. Notice how much of the flavor is due to the fragrance.

When you have a cold and your nose is "stopped up," why do you suppose your food becomes tasteless and uninteresting? The above experiments will answer this question for you.

Experiment 18. Hold your nose and taste the salt, sugar, citric acid and quinine in turn. To be sure to get the pure taste of each, rinse your mouth with water between each test. Does the cutting off of the sense of smell affect the four basic tastes? You will find that there is no change in the taste. The four basic taste sensations do not involve the olfactory sense.

Experiment 19. Blindfold a friend and feed him a piece of banana, pear and several peeled and seeded grapes. Can he identify them? If so, is it their texture that gives the clue? The texture of foods is important to the enjoyment of certain foods such as the smoothness of ice creams and chocolates and the crispness of crackers and potato chips. The enjoyment of

the bubble gum in this unit also depends upon its texture in addition to its flavor.

These qualities have nothing to do with taste, but are intimately associated with it and are essential factors where food is concerned.

Experiment 20. Take a little cayenne or chili pepper and place it on the tip of your tongue. You would describe its taste as "hot." This sensation is due to the sense of touch or the tactile sense, and has no relation to either taste or smell.

Place the pepper on various parts of the tongue. Do you get a reaction on all areas?

Place some pepper on your lips and the palate. Are they sensitive to the pepper also?

Receptors for the sense of touch are distributed on the tongue, palate and also on the lips and gums.

Tasters of wine do not swallow the fluid but roll it on their tongue to test its flavor and texture. The same is true in judging tea or coffee.

TASTE BLINDNESS

Experiment 21. Drink a little water so your taste buds can recover from the previous experiments, then tear off a little of the white paper impregnated with

phenylthiocarbamide and chew it.

Can you taste the PTC? If so, is it bitter? Do you get an immediate reaction or is it delayed? If you do not taste the small piece, tear off a larger one and chew the two together. Some who cannot taste a small amount can taste it in larger quantities.

About three out of ten persons find PTC completely tasteless, while the rest find it bitter. To some of those who do not taste PTC as bitter, it may be sweet, sour or salt.

Experiment 22. Get some of your family and friends to taste the paper. Let them describe the taste to you. Be sure to have some gum, candy or sugar handy just in case they find it intensely disagreeable.

Make a record of your findings. Try to experiment on as many people as you can and see how your statistics compare with those the scientists have collected. Of course, to make a truly reliable survey you would need a great number of cases.

If you do not taste PTC, you may discover that other members of your family also find it tasteless. "Taste blindness" to PTC is hereditary. If both parents are non-tasters, they will have non-tasting children. If either father or mother only is a taster,

however, some of the children may be non-tasters and others tasters.

It has been found that the inability to detect the bitter taste in the crystals or weak solutions is inherited as a Mendelian recessive trait, and those who are "tasters" have inherited a dominant gene that gives them this particular ability.

Among American whites, about 70% are tasters. The percentage is somewhat different for other races. The Chinese, for example, are reported to be 94% tasters and so also are the American Indians. This fact is used as an evidence that the Indians originally came from Asia.

People have been found to be taste blind not just to PTC, but to a number of other compounds of the thiocarbamide group. They are all closely related to another compound popularly called "dulcin," which is several hundred times as sweet as sugar. Another close relative is ANTU, a highly effective rat poison that is nontoxic to humans. In fact, it was in testing the taste blindness of rats that this powerful rat poison was discovered—all the subjects died.

Brucine, a cousin of strychnine and also poisonous, is bitter to the minority who taste it.

A person who is taste blind to one of

these substances, however, may be a taster of others.

Experiment 23. There are a few other materials also that cause different reactions. Mannose, for example, is sweet to some, bitter to others and both sweet and bitter to still others. Sodium benzoate, a food preservative, causes an even greater variety of reactions. Though many claim it to be tasteless, others report it to be sweet, sour, bitter, salt and a few "just plain awful." If these substances are available, try them on friends to get their reactions.

The above experiments demonstrate that the ability to taste things cannot always be compared. If you have something wrong with your taste buds, for instance, things may taste differently to you than to your friends. Thus you may like a food your friends detest or like the same food for different reasons.

The taste threshold, or the level at which a minimum amount of a substance produces a taste response, varies from person to person. Thus a food that may seem salty to one person may be bland to another.

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TASTE

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Scientists have found that the higher a person's sensitivity to the taste of bitter substances such as quinine, or the lower his threshold, the more foods he is apt to dislike.

Our sense of taste plays an important part in our choice of foods and their enjoyment and ultimately our health, since it is what we eat that will determine whether we are well-nourished or not.

The mechanism of taste is still not clear and there is still much research going on in this field. If you wish to pursue the subject further, textbooks on physiology will be helpful.

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